Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

DESCRIPTION OF TWO NEW SPECIES OF PERONOSPORA.

By M. B. Waite.

Peronospora celtidis.

(Plate XVII, Figs. 1-16.)

Spots definite, angular, minute, about 1^{mm} or less in diameter, limited by the veinlets; by confluence forming irregular patches or covering the greater part of the leaf; dark purple above, and when close together surrounded by an indistinct yellow border; on the under side at first dark green in color, with a water-soaked appearance, becoming ashy gray as the conidiophores are thrown up, then brownish, the confluent patches soon becoming brown.

Mycelial hyphæ small, delicate, much branched, from 3 to $7\frac{1}{2}\mu$ in diameter, averaging about 6μ, with very thin and hyaline cell walls. Haustoria not seen.

Conidiophores slender, four to five times branched and bearing from 14 to 28 conidia, branching in the so-called dichotomous manner, but with the first branch extending outward at nearly a right angle. Branches and tips nearly straight, tips gradually tapering to a blunt point. Total length of the conidiophores 200 to 320μ. Length of the stem to the first branch nearly equal to the length of the head from the first branch to the tip.

Conidia elliptical, nearly twice as long as broad, 14 by 26μ to 20 by 38μ, averaging about 16 by 31μ, provided with a blunt apiculus and a swelling at the base which closely resembles that at the apex, making the two ends appear alike, dark, smoky colored; germinating by zoöspores, eight or nine in number, which break through the apical papillus. In living specimens viewed with a low power of the microscope as an opaque object the conidia appear black, and the conidiophores are hygroscopic.

Oospores produced abundantly in the leaf parenchyma, to which the whole fungus seems to be limited; subglobose, light brown in color, 28 by 36μ to 30 by 44μ; endospore rather thin; exospore smooth, quite variable in thickness, causing the margin of the oöspore to appear undulate in cross section. Walls of the oögonium thin.

On *Celtis occidentalis*, L. Washington, D. C., October 7, 1891, Herb. M. B. Waite, No. 556; October 9, 1891, Herb. M. B. W., No. 557. Still Pond, Md., October 10, 1891, Herb. W. T. Swingle, Nos. 4026, 4027.

Observations:—This species is an exceptional form in many respects. It is the only species in the family so far found growing on a tree, although *Phytophthora omnivora* grows on seedlings of *Fagus* and other trees, and *Plasmopara viburni*, Peck, on *Viburnum; P. viticola*, on *Vitis; P. ribicola* on *Ribes*, *Peronospora sparsa* on *Rosa* and *P. rubi* on *Rubus* all grow on woody plants. The spots formed on the leaves are usually small and would at first glance scarcely be thought to be the work of a Peronospora. The leaves of the host plant are harsh and firm in texture. Whether from adaptation to this peculiar host or from other causes this species seems to have developed on different lines from most Peronosporaceæ. It does not fit well into the present scheme of classification. The germination by zoöspores would suggest Plasmopara, but the long, dark-colored conidia are much unlike the typical conidia of that genus, which are small, orbicular, and hyaline. The conidia of this species are also remarkable for the papillus at the base. The conidiophores are similar to those of Peronospora, but the nearly straight branches and the tendency of the first branch to come out at nearly a right angle gives at least a suggestion of Plasmopara. It should be remarked that the so-called pinnate conidiophores of Plasmopara are not pinnate. The lateral branches are rather short and are arranged along a lengthened axis after the manner of the two-fifths phyllotaxy in phenerogams. In the dichotomous forms, as in Peronospora, the branches are arranged in the same way except that the lowest branch is relatively long and extends upward rather than straight out, but there is rarely any difficulty in deciding which is the main stem. They are not, then, truly dichotomous.

The conidiophores of *P. celtidis*, while of the type *Peronospora*, may be regarded as a step toward *Plasmopara.* So far as known to me no one has studied the exact arrangement of the branches of the conidiophores of any species of this order. Outline drawings are scarcely satisfactory representations of these objects, because they do not clearly indicate whether a given branch extends up or down from the plane of the drawing. The figures of the conidiophores given on Plate XVII are open to this objection. It is not easy to determine how each branch extends, much less to represent it accurately in a drawing.

The mycelium of this species looks quite unlike the typical mycelium of Peronospora. It is much more delicate and somewhat resembles that of the Uredineæ. The oöspore is apparently identical with that of the section *Effusæ.* The oöspores of the two species represented on the plate are strikingly similar except in size. But with all the characters taken into account one would scarcely wish to place *P. celtidis* in the section *Effusæ.* Mr. W. T. Swingle has pointed out to me that *Peronospora cubensis*, B. and C., resembles *P. celtidis* quite closely, and is its nearest ally, and that these two species form a group by themselves, differing considerably from either *Peronospora* or *Plasmopara.* Both have long, very dark conidia, pointed at each end and germinating by zoöspores, with conidiophores of the so-called dichotomous type, and strongly hygroscopic. For the present the form on Celtis is thought to be best placed in the genus *Peronospora.*

PERONOSPORA HYDROPHYLLI.

(Plate XVII, Figs. 17-24.)

Spots yellowish on both sides of the leaf, but more visible from above, 2 to 4^{mm} broad by 10 to 25^{mm} long, with rather indistinct margins, limited laterally by the veins, or by confluence covering the greater part of the leaf, becoming brown with age or causing the whole leaf to shrivel up. Under surface of the spots sparsely frosted by the conidiophores.

Mycelial hyphæ occasionally branching, quite irregular, narrowed down at frequent intervals to half the average diameter and covered with protuberances, some of which are sufficiently extended to form branches; diameter varying from 6 to 7μ in the constricted portions to 15 or 16μ, or even more, in the swollen parts, averaging 10 to 12μ.

Haustoria small, 15 to 24μ long, consisting of a short, broadly clavate branch with three to five finger-like small branches arranged in a whorl around its apex.

Conidiophores rather large, dichotomously many times branched, the branches bent into reversed curves and often twisted around each other; tips slender, tapering to a blunt point, curved or often with a reversed curve, numbering sixteen in a small specimen to fifty on an average, or to seventy-five on a very large one. Total length of the conidiophore varying from 200 to 450μ, length of the stem to the first branch varying from one-half to four-sevenths the total length. The first branch is relatively large, usually from two-thirds to three-fourths of the length of the whole head, and contains about that proportion of the tips, often nearly equaling the rest of the head.

Conidia ovate, without apical papillæ or marks to indicate the point of attachment; smoky colored, measuring 19 by 28μ to 25 by 35μ, averaging about 21 by 30μ; germinating by means of a lateral tube which is often curved in a loose spiral and usually at one or two points swollen abruptly to twice the normal size, which is gradually resumed again.

Oöspores produced in the leaf parenchyma, subglobose, 39 to 45μ in diameter, light brownish in color; endospore rather thick; epispore thin in places, causing the margin of the spore to become undulate in section. Walls of the oögonium thin.

On *Hydrophyllum Virginicum*, L. Oregon, Ill., June 1, 1888. Herb. M. B. Waite, No. 558. Near Washington, D. C., May 5, 1889, No. 559, a single infected plant. Iowa City, Iowa, spring, 1888. A. S. Hitchcock.*

Observations.—It will be seen from the description and drawings that this species is a typical *Peronospora* of the section *Effusæ*. It presents no difficulties in classification unless it be in the fact that the species in the section *Effusæ* are not very clearly defined, and botanists are obliged to depend mainly on the host plants for the determination of the species. The germination of the conidia was accomplished by placing them in water on a glass slide, under a bell jar. The conidia used for the purpose were taken from fresh leaves which had been gathered in the tin collecting box and had remained there several hours. They were placed in water during the day, and on the following morning they had thrown out their germ tubes. These show one or more peculiar swellings or bulb-like expansions. This is not rare in the Peronosporaceæ, but has been observed in a number of species. De Bary figures* the germinating conidia of *P. effusa* and several other species showing this character.

---

* These specimens are mentioned, but not described, by McBride and Hitchcock, in Bull. No. 1, from the Laboratories of Nat. Hist. of the State Univ. of Iowa, p. 51.

There is often more than one conidiophore extending from a stoma. In some cases as many as five were seen. (Plate XVII, Fig. 19.) The manner in which the conidia originate from the mycelium is the same as in *Bremia lactucæ* as figured by Cornu.† A mycelial thread running near a stoma sends out a branch which is contracted at the point of emission, but soon swells out so as to nearly equal the parent branch. As it nears the opening of the stoma it narrows down to a small filament which passes through the opening between the guard cells and then swells out into the bulb-like base of the conidiophore.

Type specimens of both these species have been deposited in the herbarium of the Division of Vegetable Pathology, U. S. Department of Agriculture, and have been sent to the following herbaria: Philadelphia Academy of Science; Columbia College, New York; Harvard University, Cambridge, Mass.; Royal Herbarium, Kew, England; Museum of Natural History, Paris; Royal Botanic Garden, Berlin; Royal Botanic Garden, Rome; Museum of the Royal Botanic Garden, St. Petersburg, and to several individuals.

EXPLANATION OF PLATE XVII.

Figs. 1–16, *Peronospora celtidis*, n. sp.

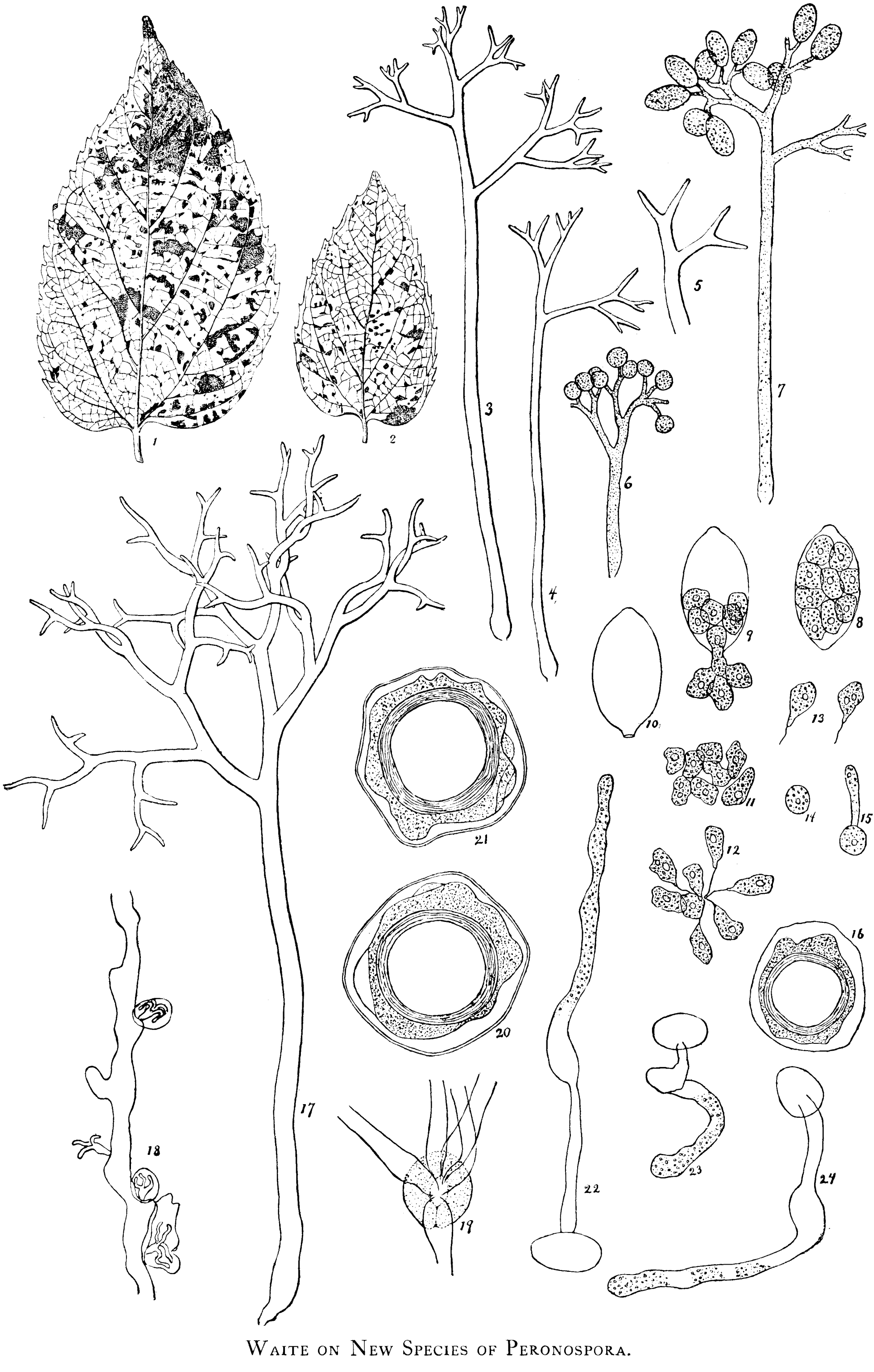
Figs. 1, 2. Leaves of *Celtis occidentalis* showing spots caused by the Peronospora.
3. Typical conidiophore × 224. The branches do not all lie in one plane, as the figure might lead one to think, but are arranged around the stem like the branches of a tree. The lowest branch extends to the right and upward; the second branch extends to the left and also slightly upward.
4. Conidiophore below the average size, × 224.
5. Tips of the conidiophore more enlarged, × 640.
6. Young conidiophore with conidia attached, × 224.
7. Conidiophore nearly mature but with protoplasm still in the stem, × 224.
8. Conidium, with its contained zoöspores, just ready to burst.
9. Conidium discharging its zoöspores.

---

*Recherches sur le développment de quelques Champignons Parasites. Ann. Sci. Nat. Botanique, sér. 4^{e} tome xx, Plate 8, Fig. 7.

†Institute de France. Académie des Sciences. Observations sur le Phylloxera et sur les Parasitaires de la Vigne, etc. Études sur les Péronosporées. I. Le Meunier, Maladie des Laitues, 1881.

JOURNAL OF MYCOLOGY, U. S. DEPARTMENT OF AGRICULTURE. VOL. VII, PLATE XVII.



WAITE ON NEW SPECIES OF PERONOSPORA.

Fig. 10. Empty conidium.
11. Mass of zoöspores just escaped and still fastened together.
12. The same breaking apart.
13. Zoöspore swimming free. One cilia represented. Two or three doubtfully observed.
14. Zoöspore rounded up and at rest.
15. Zoöspore germinating.
16. Oöspore in section, × 640.

Figs. 17–24, *Peronospora hydrophylli*, n. sp.

17. Conidiophore, average size, × 224.
18. Mycelium, with haustoria and cells of the host penetrated by them, × 224.
19. Stomate, with five conidiophores extending from it, × 224.
20, 21. Oöspores in section, × 640.
22–24. Germinating conidia.

SOME PERONOSPORACEÆ IN THE HERBARIUM OF THE DIVISION OF VEGETABLE PATHOLOGY.

By W. T. Swingle.

Finding a number of interesting species of Peronosporaceæ in the herbarium of the Division of Vegetable Pathology, I have decided to report on all specimens there represented that have not been mentioned previously. I have included a number of interesting forms collected during the past year, but have excluded all specimens in exsiccati as they are already known to most students of the group. I have included every collection, even of the most common species, because the record of date and locality may, even in such cases, prove of value in the future. Every specimen has been examined for oöspores and they have been reported whenever found. Nothing is mentioned in the paper that is not represented by a specimen in the herbarium.

ALBUGO (Persoon, §).

S. F. Gray. A natural arrangement of British plants, vol. 1, 1821 p. 540, No. v, p. 155.
1801. *Uredo* §*Albugo*, Persoon. Synopsis method. fungorum, p. 223.
1847. *Cystopus*, J. H. Léveillé, Sur la disposition méthodique des Urédinées. <Ann. des Sci. Nat., 3e sér., Botanique, tome 8, Paris, 1847, p. 371.

There seems to be no doubt that the generic name *Cystopus* must be abandoned in favor of *Albugo*, which has twenty-six years priority. There can be no question as to the identity of the two genera. Gray includes *Albugo* in the subfamily *Cœomideœ* which he describes thus:

> Sporidia dust-like, free, heaped, sessile or pedicelled, one or many celled, growing at first under the epidermis of living plants, then bursting through it, naked or covered with a false peridium or thecæ formed of the epidermis of the plant on which it grows.*

---

* Loc. cit., p. 532.